

### **REMARKS**

This Amendment, submitted in response to the non-final Office Action dated July 20, 2006, is believed to be fully responsive to the points of rejection raised therein. Accordingly, favorable reconsideration on the merits is respectfully requested.

Claims 1-21 are pending. Claims 22-31 are cancelled in response to a restriction requirement. Claims 1, 3, 12 and 15 are amended above. No new matter has been added, and support for the amendments can be found, for example, on page 7, lines 11-16 of the present application.

Claims 1, 2, 8, 10-12, 15, 18 and 20 have been rejected under 35 USC 102(b) over U.S. Patent No. 6,355,156 (Li). Claims 3-7, 13, 14, 16, 17 and 19 have been rejected under 35 USC 103(a) over Li, in view of US 2003/0079989 (Klocke). Claims 9 and 21 have been rejected under 35 USC 103(a) over Li, in view of US Patent No. 5,671,263 (Raulerson). Applicants respectfully submit the following comments in support of the patentability of the Claims. Reconsideration of the rejections in view of the amendments and the following remarks is respectfully requested.

**1. Claims 1, 2, 8, 10-12, 15, 18 and 20:**

Claims 1, 2, 8, 10-12, 15, 18 and 20 have been rejected under 35 USC 102(b) over Li.

Claim 1 is amended above for clarification. Support for the amendment can be found, for example on page 7, lines 11-16 of the present application. Amended Claim 1 is directed to a method of monitoring machining in an electrochemical machining tool assembly having at least one electrode arranged across a gap from a workpiece, the electrode being energized by application of a potential difference  $\Delta V$  between the electrode and the workpiece. The method includes exciting at least one ultrasonic sensor to direct an ultrasonic wave toward a surface of the electrode. The method further includes receiving a reflected ultrasonic wave from the surface of the electrode using the ultrasonic sensor, the reflected ultrasonic wave comprising a number of reflected waves from the surface of the electrode and from a surface of the workpiece. The method further includes synchronizing the excitation of the ultrasonic sensor to a machining cycle of the electrochemical machining tool, the synchronizing comprising delaying the

excitation of the ultrasonic sensor a dwell time  $T_d$  after a reduction of the potential difference  $\Delta V$  across the electrode and the workpiece occurs, such that the exciting and receiving are performed during a number of machining off-times.

In contrast, Li does not teach or suggest synchronizing the excitation of the ultrasonic sensor to a machining cycle of the electrochemical machining tool, the synchronizing comprising delaying the excitation of the ultrasonic sensor a dwell time  $T_d$  after a reduction of the potential difference  $\Delta V$  across the electrode and the workpiece occurs, such that the exciting and receiving are performed during a number of machining off-times. Rather, as noted on page 3 of the present application, Li suggests that the DC power supply may be turned off for a brief period of time, such as for the time interval used in pulsed electrochemical machining, so as to minimize the generation of gas bubbles for more accurate measurements. (See Col. 5, lines 37-45 of Li.) However, adjusting the ECM voltage could potentially compromise ECM machining quality. In contrast, by synchronizing the excitation of the ultrasonic sensor to the machining cycle of the electrochemical machining tool, improved ultrasonic monitoring is achieved without compromising electrochemical machining quality.

The Examiner asserts that a dwell time would be inherent to the method of Li. Regardless, Li does not teach or suggest the claimed synchronization, neither recognizing a need for synchronization nor disclosing means for accomplishing the synchronization. For at least these reasons, Applicants respectfully submit that claim 1 is not anticipated by Li and respectfully request that the rejection of Claim 1 under 35 USC 102(b) over Li be withdrawn. Further, as Claims 2, 8, 10 and 11 depend from Claim 1, these claims are also not anticipated by the cited art for at least these reasons.

Claims 12 and 15 are amended above for clarification. No new matter has been added, and support for the amendments can be found, for example on page 7, lines 11-16 of the present application. Applicants respectfully submit that Claims 12 and 15 are not anticipated by Li for reasons analogous to those presented above with reference to Claim 1. Further, as claims 18 and 20 depend from Claim 15, these claims are also not anticipated by the cited art for at least these reasons. In view of the above, Applicants

respectfully request that the rejections of Claims 1, 2, 8, 10-12, 15, 18 and 20 under 35 USC 102(b) over Li be withdrawn.

**2. Claims 3-7, 13, 14, 16, 17 and 19:**

Claims 3-7, 13, 14, 16, 17 and 19 have been rejected under 35 USC 103(a) over Li, in view of Klocke.

Claim 3 depends from amended Claim 1 and is amended above to clarify that the synchronizing comprises delaying the excitation of the ultrasonic sensor a dwell time  $T_d$  after a start of one of the measurement periods  $\Delta t_M$ . As discussed above, Li does not teach or suggest synchronizing the excitation of the ultrasonic sensor to a machining cycle of the electrochemical machining tool, as recited by amended Claim 1. In addition and as noted by the Examiner, Li does not teach the additional recitations of Claim 3. Regardless, Applicants respectfully submit that Claim 3 is patentably distinguishable over Li for at least the reasons discussed above with reference to Claim 1.

Claim 4 depends from Claim 1 and further recites that the dwell time  $T_d$  is in a range of about seven milliseconds (7 ms) to about 15 milliseconds (15 ms). Klocke does not supply the deficiencies of Li discussed above with respect to Claim 1. The Examiner cites Klocke for various teachings regarding bubble formation in a reaction vessel used to deposit photoresist onto microelectronic workpieces. (Numbered paragraphs 2, 76 and 77). However, Applicants respectfully submit that Klocke does not teach or suggest a dwell time  $T_d$  that is in a range of about seven milliseconds (7 ms) to about 15 milliseconds (15 ms), as recited by Claim 4. On the contrary, Paragraph 77 cited by the Examiner suggests a list of variables to produce relatively void-free photoresist films (for example agitation of the bath and vibration of the workpiece), none of which at all suggests a dwell time, let alone the recited dwell time. Paragraph 76 of Klocke merely teaches that the use of pulsed plating current during deposition may also reduce the overall bubble content of the bath. In addition Applicants respectfully submit that the Examiner's arguments address only the lower limit recited in Claim 4 and do not address the upper limit. Accordingly, Applicants respectfully submit that Klocke does not teach or suggest the additional recitation of Claim 4. Nor does Klocke supply the above-

discussed deficiencies of Li. Accordingly, Applicants respectfully submit that Claim 4 is patentably distinguishable over Li and Klocke, either alone or in combination.

Claims 5-7 depend from Claim 1. As discussed above, Li does not teach or suggest synchronizing the excitation of the ultrasonic sensor to a machining cycle of the electrochemical machining tool, as recited by amended Claim 1. Klocke does not supply this recitation of Claim 1. For at least these reasons, Applicants respectfully submit that Claims 5-7 are patentably distinguishable over Li and Klocke, either alone or in combination.

Claims 13 and 14 depend from Claim 12. Klocke does not supply the above discussed deficiencies of Li with respect to Claim 12. Further, Applicants respectfully submit that Klocke fails to teach the additional recitation of Claim 14 for the reasons discussed above with reference to Claim 4. For at least these reasons, Applicants respectfully submit that Claims 13 and 14 are patentably distinguishable over Li and Klocke, either alone or in combination.

Claims 16, 17 and 19 depend from Claim 15. Klocke does not supply the above discussed deficiencies of Li with respect to Claim 15. Further, Applicants respectfully submit that Klocke fails to teach the additional recitation of Claim 17 for the reasons discussed above with reference to Claim 4. For at least these reasons, Applicants respectfully submit that Claims 16, 17 and 19 are patentably distinguishable over Li and Klocke, either alone or in combination. In view of the above, Applicants respectfully request that the rejections of Claims 3-7, 13, 14, 16, 17 and 19 under 35 USC 103(a) over Li, in view of Klocke, be withdrawn.

**3. Claims 9 and 21:**

Claims 9 and 21 have been rejected under 35 USC 103(a) over Li, in view of Raulerson.

Claim 9 depends from Claim 8 and further recites that the exciting step includes exciting a first ultrasonic sensor to direct an ultrasonic wave toward a surface of one of the electrodes and exciting a second ultrasonic sensor to direct an ultrasonic wave toward

a surface of another of the electrodes. Claim 9 further recites that the receiving step comprises receiving respective reflected ultrasonic waves from the surface of each of the respective electrodes using the respective ultrasonic sensors. Claim 9 also recites that the delaying step comprises delaying the excitation of a first one of the ultrasonic sensors the dwell time  $T_d$  after a reduction of the potential difference  $\Delta V$  across the electrodes and the workpiece occurs and delaying the excitation of the other of the ultrasonic sensors the dwell time  $T_d$  plus an offset  $\delta$  after a reduction of the potential difference  $\Delta V$  across the electrodes and the workpiece occurs, where the offset  $\delta$  is at least the time required to attenuate the ultrasonic wave from the first one of the ultrasonic sensors.

The Examiner cites Raulerson for the use of two ultrasonic sensors. As discussed at Col. 5, lines 3-6 and shown in FIG. 1 of Raulerson, the sensors 32 sense the distance between the inner 14 and outer 16 surfaces of the metallic workpiece 10. There is no suggestion in Raulerson of exciting a first ultrasonic sensor to direct an ultrasonic wave toward a surface of one of the electrodes and exciting a second ultrasonic sensor to direct an ultrasonic wave toward a surface of another of the electrodes, as recited by Claim 9. Nor does Raulerson teach or suggest any of the additional recitations related to the receiving step and the delaying step. Nor does Raulerson supply the above-discussed deficiencies of Li with respect to independent Claim 1. Accordingly, Applicants respectfully submit that Claim 9 is patentably distinguishable over the cited art, either alone or in combination.

Claim 21 depends from Claim 15 and further recites controlling at least one of the energizing and the feeding in response to the monitoring data. Regardless of whether Raulerson teaches the additional recitation of Claim 21, Raulerson does not supply the above-discussed deficiencies of Li with respect to independent Claim 15. Accordingly, Applicants respectfully submit that Claim 21 is patentably distinguishable over the cited art, either alone or in combination.

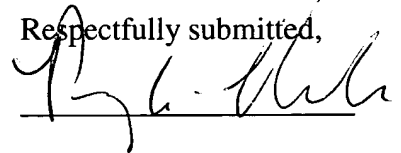
**CONCLUSION**

In view of the foregoing, Applicants respectfully submit that the application is in condition for allowance. Favorable reconsideration and prompt allowance of the application are respectfully requested.

**Please charge all applicable fees associated with the submittal of this Amendment and any other fees applicable to this application to the Assignee's Deposit Account No. 07-0868.**

Should the Examiner believe that anything further is needed to place the application in even better condition for allowance, the Examiner is requested to contact Applicants' undersigned representative at the telephone number below.

Respectfully submitted,



Penny A. Clarke  
Reg. No. 46, 627

General Electric Company  
Building K1, Room 3A72  
Niskayuna, New York 12309  
Oct 5, 2006  
Telephone: (518) 387-5349